

Microbial Response to Oil Spill

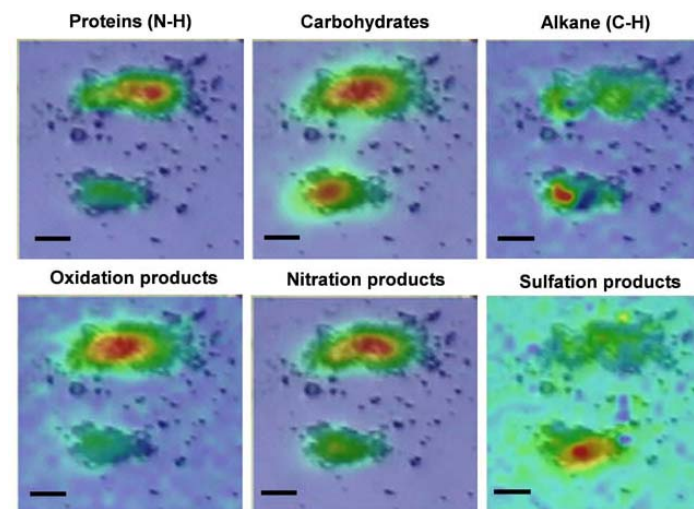
Molecular measurements of the deep-sea oil plume in the Gulf of Mexico.

- Deepwater Horizon oil spill, Gulf of Mexico, April 20, 2010
 - Largest oil spill in United States history
 - Environmental and public-health impacts difficult to assess
 - Reasons: Extreme depth and magnitude, use of dispersant
 - Question: Can deep-sea microbes help degrade the oil?
- 17 deep-water samples taken between May–June 2010
 - Oil plume detected at depths of 1099–1219 meters
 - Coincided with higher microbial cell densities
 - Slightly lower oxygen, consistent with microbial respiration
 - Samples dominated by cold-water species
- Infrared spectromicroscopy studies at ALS Beamline 1.4.3
 - Ideal for studying living bacteria individually or in small groups
 - Provides nondestructive, fingerprint-like spectra
 - Observed spectral features of C=O, NO_x, SO_x vibration modes
 - Markers for oil degradation products, biological macromolecules
 - Not present in nonplume samples at same depth
- Oil half-life predicted to be between 1.2 and 6.1 days

The oil plume stimulated indigenous deep-sea bacteria closely related to known petroleum degraders.



The oil slick in the Gulf of Mexico as seen from a helicopter (photo by Rick Loomis, Los Angeles Times, May 6, 2010).



Scale bars = 10 micrometers

Infrared images (~60 by 60 μm) showing the spatial distribution of microorganisms, oil, and oil degradation products.